

U.S. Patent Application Serial No. 09/926,160  
Amendment filed June 28, 2005  
Reply to OA dated March 28, 2005

**REMARKS**

Claims 1 and 5-7 are pending in this application. Claim 1 has been amended and claim 8 has been canceled without prejudice or disclaimer. The Applicant respectfully submits that no new matter has been added. It is believed that this Amendment is fully responsive to the Office Action dated **March 28, 2005**.

Support for the amendment to claim 1 is discussed below. A spelling error in claim 1 is also corrected.

**Claims 1 and 5-8 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. 6,316,089 to Ohtani et al. in view of U.S. 5,847,036 to Takabatake et al. as set forth in section 4 of the previous Office action.** (Office action paragraphs no. 2 and 3)

The rejection of pending claims 1 and 5-7 is overcome by the amendment to claim 1. Claim 1 is amended so as to include the limitation of claim 8, that the polymer (b) is produced in an emulsion form by an emulsion polymerization method. Support for this amendment can be found on page 8, line 21, to page 9, line 9, of the specification. Applicant submits that claim 8, which has accordingly been canceled, was non-obvious over the cited references.

As amended, claim 1 includes the following limitations:

- (1) **A photocurable sheet-form material** comprising:
  - (a) a polymerizable unsaturated monomer;

(b) a polymer which is either polymethyl methacrylate or a polymer consisting mainly of methyl methacrylate units and which is compatible or swollen with the monomer (a), wherein the polymer (b) is produced in a powdered form having a wight average molecular weight of 100,000 or more, and wherein the particle diameter of the polymer (b) is 300 to 5000 Angstroms;

(c) a photocuring agent;

(d) fibrous reinforcement; and

(e) one or more resins selected from a (meth)acrylic polymer, an unsaturated polyester, a vinyl ester, or an urethane acrylate; and

(2) **the polymer (b) is produced in an emulsion form by an emulsion polymerization method** and the particle diameter of the polymer (b) is 300 to 5000 Angstoms.

Regarding Ohtani's "polymethyl methacrylate". In the rejection, the Examiner modifies the polymethyl methacrylate of Ohtani by substituting (meth)acrylic polymer of Takabatake that is made by suspension polymerization. However, Applicant submits that this modification represents improper use of hindsight by the Examiner. First of all, Ohtani's "polymethyl methacrylate" (column 22, line 15) is merely one example of a resin used as a "low-shrinkage material", and it is listed quite equally with polystyrene, polyethylene, polyvinyl acetate, etc. Applicant notes, however, that it is impossible to use the polystyrene, polyethylene, and polyvinyl acetate, etc. as polymer (b) of the present invention.

Moreover, mere "polymethyl methacrylate" cannot be used, and the present invention is limited to polymethyl methacrylate having specific properties. That is, polymer (b) is produced in

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the powder form having the weight average molecular weight of 100,000 or more. The polymer (b) is produced in the emulsion form by the emulsion polymerization method and the particle diameter of the polymer (b) is 300 to 5000 Angstroms.

In particular, it is one of the significant features that polymer (b) is produced in **an emulsion form by the emulsion polymerization method**.

In Takabatake, it is described that “polymethyl methacrylate” can be obtained by solution polymerization, block polymerization, emulsion polymerization, or suspension polymerization. “Polymethyl methacrylate” is selected in Takabatake to make the thickening condition of the resulting molding material good. However, Takabatake neither discloses nor suggests a **photocurable** molding material. No use of a photocuring agent (c) with the “polymethyl methacrylate” is suggested in Takabatake. Applicant submits that “polymethyl methacrylate” in Takabatake does not suggest any use in a photocurable molding material. Therefore, there is no suggestion or motivation for use of Takabatake’s “polymethyl methacrylate” as a low-shrinkage material of Otani’s photocurable sheet.

The Examiner states that: “it would have been obvious ... to have made the polymethyl methacrylate polymer by using a well [known] and [cost-effective] polymerization means such as emulsion polymerization”, in view of Takabatake. However, Applicant submits that there was no suggestion in either reference to prepare a **photocurable sheet** by using polymethyl methacrylate made by emulsion polymerization.

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Regarding the particle size of the suspension polymerization and the particle size of the emulsion polymerization.

In support of Applicant's arguments, Applicant also presents Table 1, below, in which the particle size of the suspension polymerization and the particle size of the emulsion polymerization are compared. This is presented in response to the Examiner's request for evidence regarding Applicant's previous argument that the polymethyl methacrylate in Ohtani would not have a particle size of 1 mm or more. Table 1 is a translation of subject matter described on page 41 of the document: "Development of low viscosity paste vinyl chloride wallpaper grade" (Researchers: Shinichi Yoshida, Youji Matumoto), *TOSOH Research & Technology Review*, Vol. 46 (2002). This document is made of record in an Information Disclosure Statement concurrently filed with this Amendment.

The data in Table 1 are directed primarily to polymerization methods of vinyl chloride resin, but they are applicable to polymerization methods for the polymethyl methacrylate of the present invention. In Table 1, it is described that the particle size of polymer by the emulsion polymerization is 0.1-0.5  $\mu\text{m}$ . On the other hand, the particle size resulting from "Microsuspension polymerization," whose particle size is the smallest of the suspension polymerization methods, is 0.5-1.5  $\mu\text{m}$ . It will therefore be understood that polymer made by suspension polymerization does not have the particle size of 0.5  $\mu\text{m}$  or less that is obtained by emulsion polymerization.

Therefore, the limitation of the particle size of the present invention specifies that polymer (b) is the product resulting from emulsion polymerization.

**Table 1 Comparison of polymerization methods of paste vinyl chloride resin**

Polymerization method	Emulsion polymerization	Seeded emulsion polymerization	Microsuspension polymerisation	Seeded microsuspension polymerisation
Initiator	Water soluble initiator	Water soluble initiator	Oil soluble initiator	Oil soluble initiator (Seeding)
Particle size control	Kind of emulsifying agent Amount of emulsifying agent	Charge of seed Kind of emulsifying agent Amount of emulsifying agent	Homogenization condition	Charge of seed
Average particle diameter	0.1~0.5 $\mu\text{m}$	0.1~0.5, 0.5~1.5 $\mu\text{m}$	0.5~1.5 $\mu\text{m}$	0.1~0.5, 0.5~1.5 $\mu\text{m}$
Particle size distribution	Sharp, 1 Peak	Sharp, Polydispersity	Broad, 1 Peak	Broad, Polydispersity
Particle shape	Microphotograph	Microphotograph	Microphotograph	Microphotograph

Applicant therefore submits that claims 1 and 5-7, as amended, are novel and non-obvious over Ohtani et al. and Takabatake et al., taken separately or in combination.

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In view of the aforementioned amendments and accompanying remarks, the claims, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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